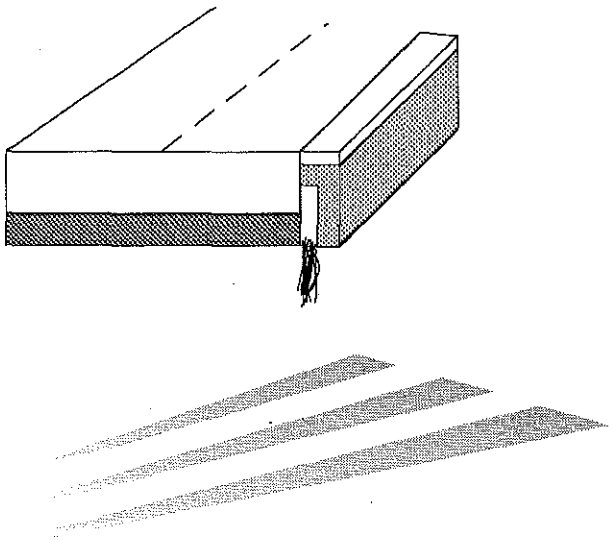
KENTUCKY TRANSPORTATION CENTER

College of Engineering

EVALUATION OF EDGE DRAINS ON I-81, IN ROANOKE, VIRGINIA



UNIVERSITY OF KENTUCKY

Research Report
KTC-96-12

EVALUATION OF EDGE DRAINS ON I-81, IN ROANOKE VIRGINIA

by

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EXECUTIVE SUMMARY

This report documents findings of the investigation of five different brands of panel edge drains installed in a test section along Interstate 81 in Roanoke, Virginia, from Milepost 154.148 to Milepost 156.11. Findings from this study indicated that closed core edge drains (Multi-Flow, Advanedge) are less likely to become damaged or distressed than the more open core drains (Contech, Akwadrain, Hydraway). Typical distress found in the more open cores was rolling over of the top row of support columns, fabric intrusion between support columns, and rolling up of the bottom row of support columns.

INTRODUCTION

In 1995, panel drains were installed on I-81, in the vicinity of Roanoke, Virginia. The panels were backfilled with a crushed granite, No. 8 aggregate. Predominately Hydraway edge drains were installed throughout the project. A two-mile test section was installed from milepost 156.110 to 154.180. Four additional edge drain products were installed in the test section. This included: Contech, Akwadrain, Advanedge, and Multi-Flow. In May 1996, personnel of the Kentucky Transportation Center (KTC) inspected the panel edge drains. This report documents the findings from this inspection.

SITE INSPECTION

On April 30, 1996, personnel from KTC and the Virginia Research Council met on I-81 to inspect the test section and to layout locations for the borescope inspection. It was observed that headwalls had not been attached to a large portion of the outlets. Eighteen of the 35 outlets inspected did not have headwalls. Headwalls had not been installed in the Contech, Multi-Flow, or Hydraway test sections (Appendix A).

BORESCOPE INSPECTION

On May 1, 1996, the panel drains were inspected with a rigid and a flexible borescope. The inspection information is contained in Table 1. Video prints showing the distress that was observed in some of the panels is contained in Appendix B. The inspection indicated that tilting or rolling of the top and bottom rows of support columns was occurring in the more open, cuspated and post-type cores (Contech, Akwadrain, Hydraway). Slight to moderate fabric intrusion was also noticed in each of the three panels. It appears that approximately five to 10 percent of the core area has been reduced in the post and cuspated drains due to rolling and fabric intrusion. The remaining 90 to 95 percent of the core appeared to be in good condition. It appears there was no core area loss in solid core drains. No distress was observed in the Advanedge panel. No distress was observed in the horizontal flow tubes of the Multi-Flow panel. It did appear that some of the vertical tubes of the Multi-Flow panel had been compressed.

Due to the time restraints on the inspection, the performance of the filter fabric on each panel was not fully evaluated. The inverts of the drains appeared to be relatively clean and did not contain any significant amount of siltation.

DISCUSSION

Rolling or folding of the top and bottom rows of support columns is typical behavior of the post and cuspated types of drainage panels. This behavior has been duplicated using the vertical compression chamber developed at the Kentucky Transportation Center. Compression of the vertical flow tubes documented in the field inspection of the Multi-Flow panel has also been observed during vertical compression tests.

Current vertical compression flow tests being conducted at the KTC indicate that rolling of the top and bottom rows, in addition to slight fabric intrusion between support columns, can reduce the total flow capacity by approximately 2 to 4 gallons per minute (using a clean, well grade, concrete sand).

TABLE 1. DISTRESS OBSERVED IN EDGE DRAIN PANELS

PANEL TYPE	LOCATION	OBSERVED DISTRESS
CONTECH	Milepost 155.730	Slight fabric intrusion between support columns. Bottom row rolled up almost in contact with upper row. Lateral offset at mid panel.
CONTECH	Milepost 155.540	Rows 4 and 5 were slightly pushed closer together. Significant fabric intrusion occurring between rows 7 and 8.
CONTECH	Milepost 155.505	Fabric intrusion between rows 4 and 5. Lateral offset at mid panel.
ADVANEDGE	Milepost 155.384	No signs of deformation. Drain appears to be in excellent shape.
ADVANEDGE	Milepost 155.225	No signs of deformation. Drain appears to be in excellent shape.
AKWADRAIN	Milepost 154.914	5th row down support columns pushed 1/3 of the way together. Slight offset at base of panel. Slight fabric intrusion between some of the support columns.
AKWADRAIN	Milepost 154.737	Fabric intrusion occurring second row from bottom. Bottom row of support columns rolled up.
MULTI-FLOW	Milepost 154.415	Inspected top tube of drain. Appeared to be in good shape. Couldn't inspect tubes below without damaging the drain.
MULTI-FLOW	Milepost 154.405	Inspected horizontal tubes 1-3, and 7-8. Tubes appear to be in good shape. Some compression appears to be occurring in some of the vertical flow tubes.
HYDRAWAY	Milepost 154.05	Top row of support columns had rolled ½ way over. Moderate fabric intrusion. The bottom row had rolled up with moderate to severe fabric intrusion occurring.
HYDRAWAY	Milepost 154.03	Bottom row of support columns had rolled up. Fabric was also folded in between the support columns.

CONCLUSIONS AND RECOMMENDATIONS

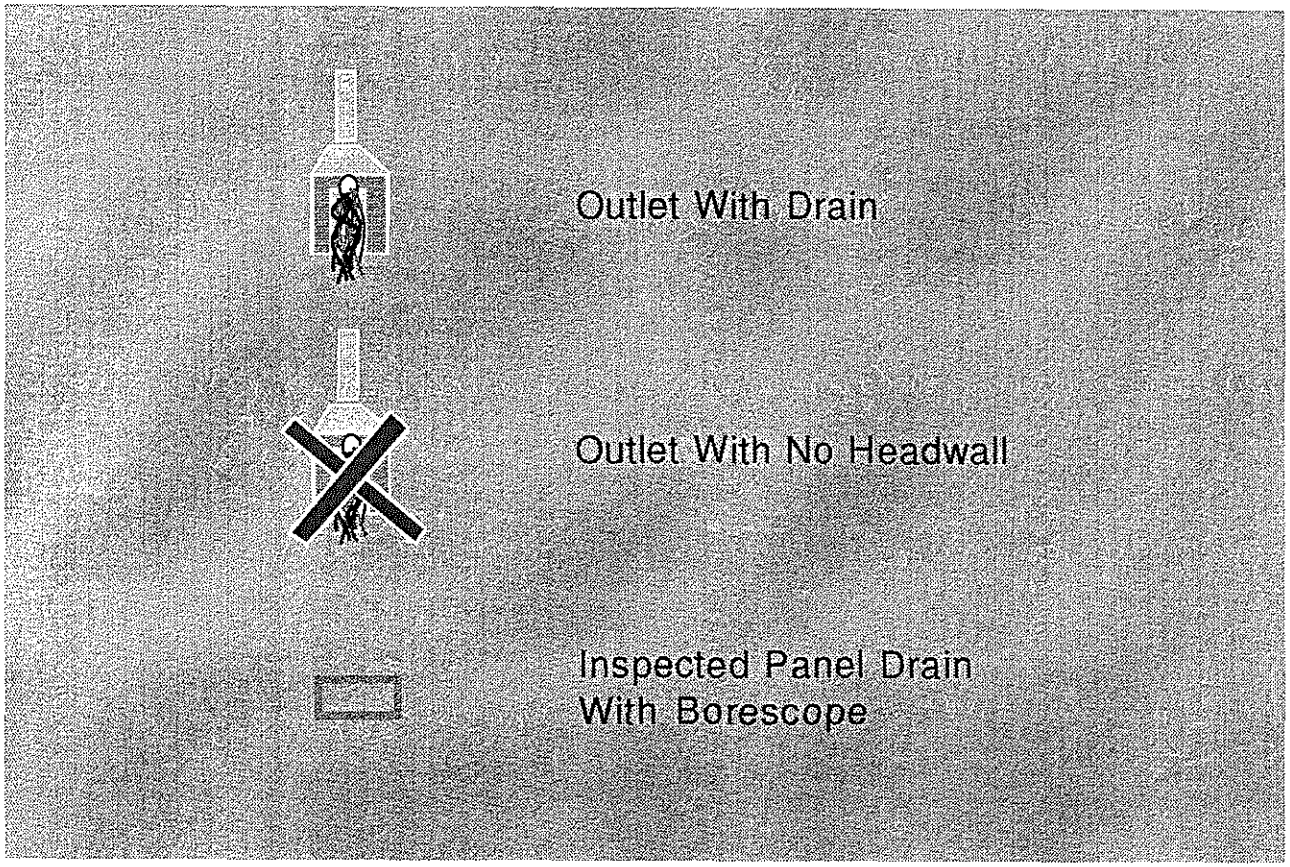
It appears the headwalls not being attached has not severely damaged the panels or the filter fabric. It is recommended that the headwalls be attached when the drain is placed. Water being held in these drainage systems can do more damage than good if they are not properly installed and maintained.

Some of the fabric intrusion observed mid-panel appears to be due to lateral offsets in the panel possibly caused by irregularities in the trench wall. In comparison to past borescoped inspections of post and cuspated core-type panel drains installed with excavated trench material, the drains appear to be in relatively good condition. Rolling of the top and bottom rows of support columns and some fabric intrusion will typically occur, and should not be attributed to the backfill material used on this project or the method of installation.

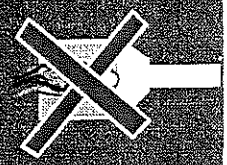
It is evident that the solid-core products appear to be more stable.

It is the opinion of the authors that expected core area changes and the associated reduction of flow should be addressed during design of these systems.

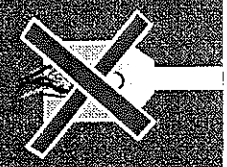
SYMBOL KEY


Outlet With Drain
Outlet With No Headwall
Inspected Panel Drain
With Borescope

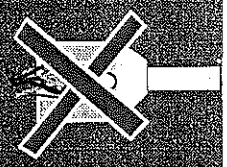
Start Contech



155.9



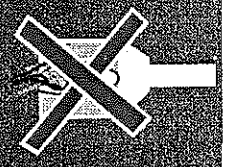
155.856



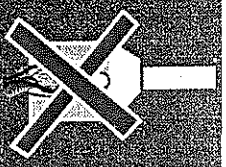
155.784

Borescoped

155.730



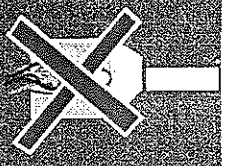
155.641



155.575

Borescoped

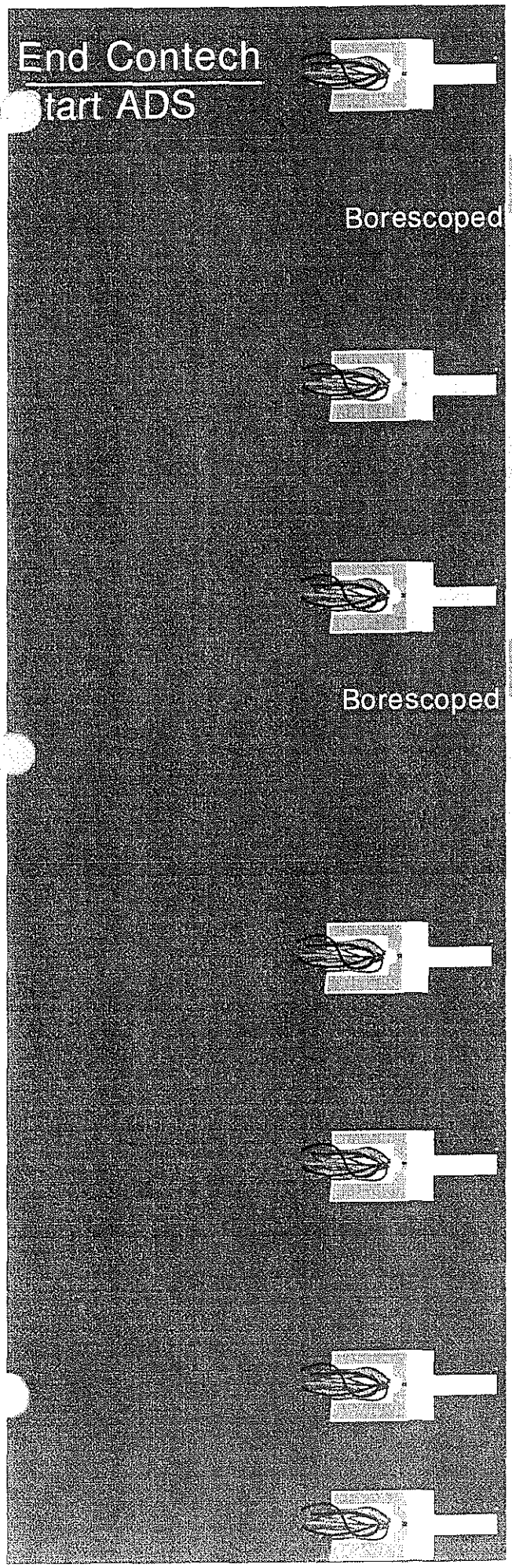
155.540

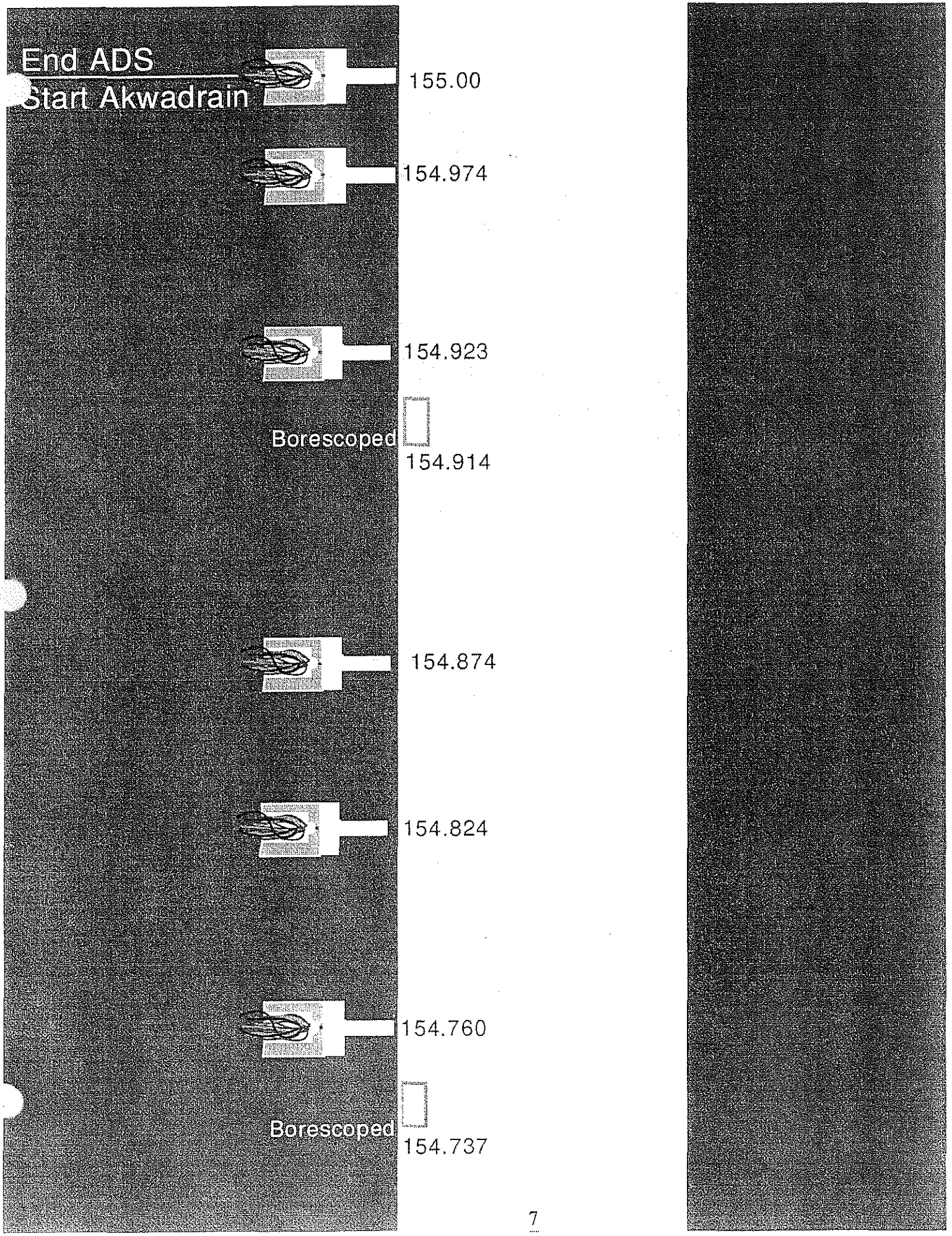


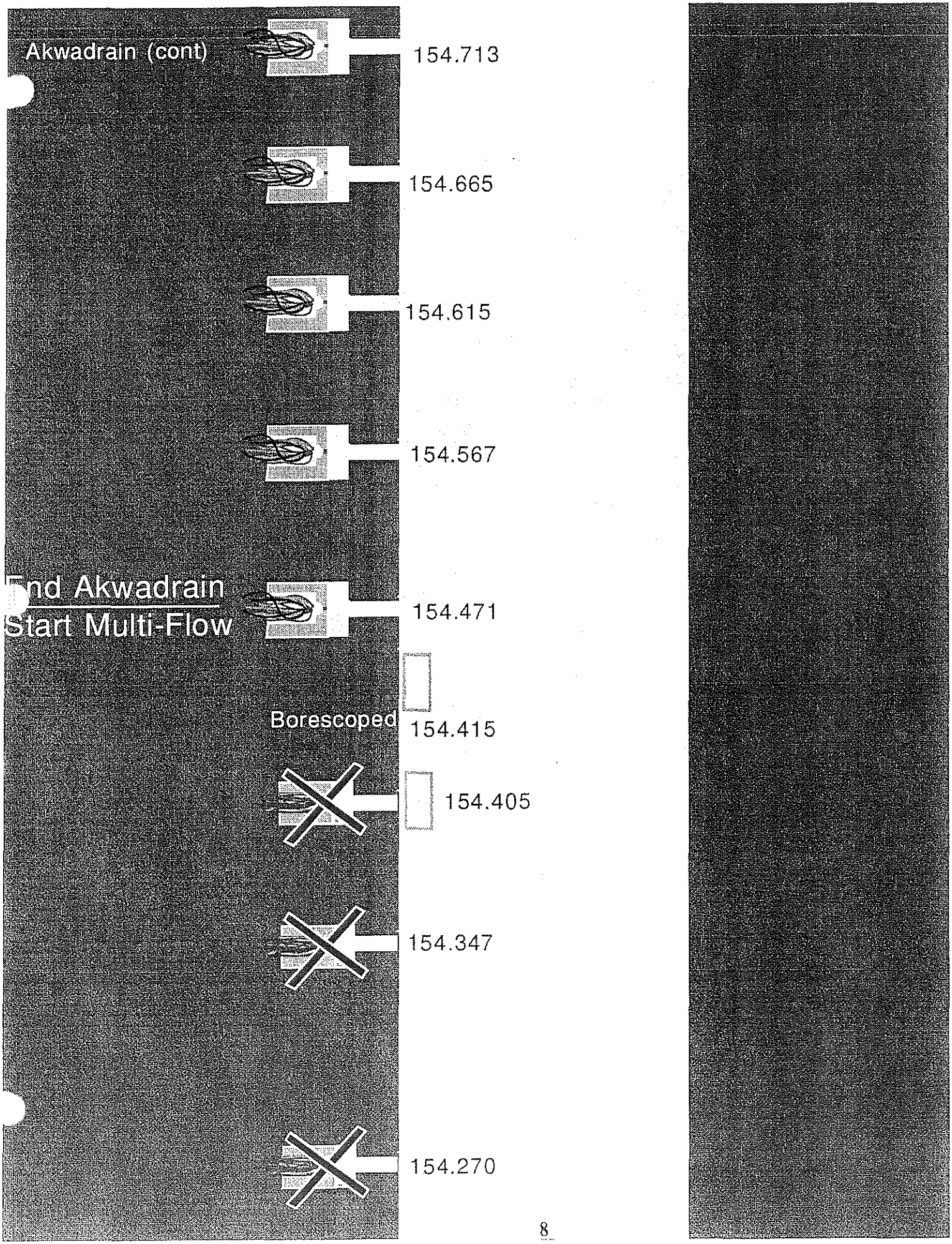
155.511

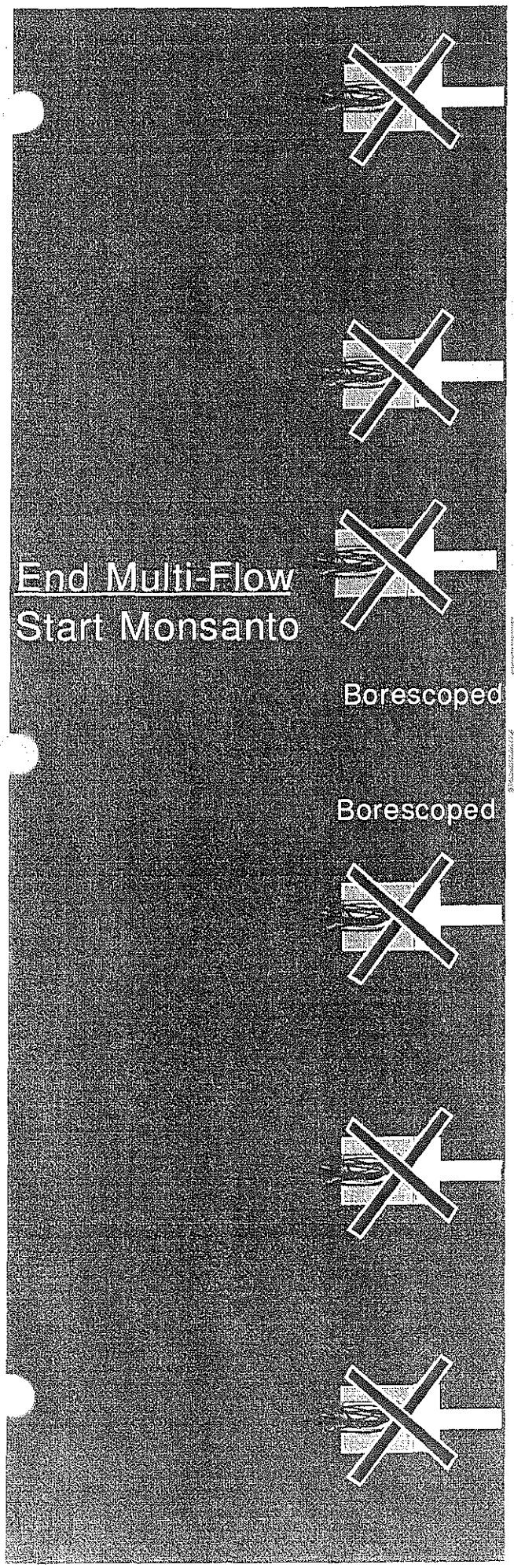
Borescoped

155.505

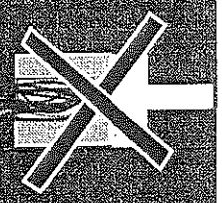

End Contech
tart ADS
155.464
Borescoped
155.384
155.377
155.234
Borescoped
155.225
155.185
155.133
155.076
155.025


End ADS
Start Akwadrain
155.00
154.974
154.923
Borescoped
154.914
154.874
154.824
154.760
Borescoped
154.737

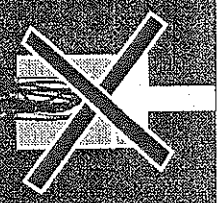

Akwadrain (cont)
154.713
154.665
154.615
154.567
End Akwadrain
Start Multi-Flow
154.471
Borescoped
154.415
154.405
154.347
154.270


154.204
154.148
154.082
End Multi-Flow
Start Monsanto
Borescoped
154.054
Borescoped
154.030
154.020
153.942
153.884

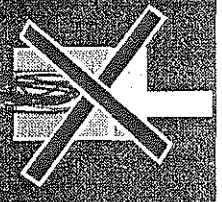
Monsanto(cont)



153.820



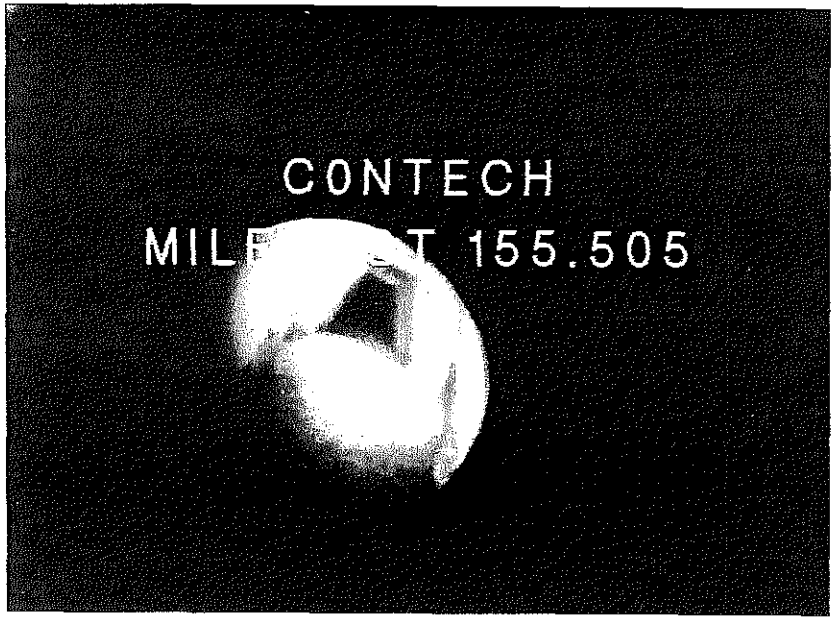
153.760



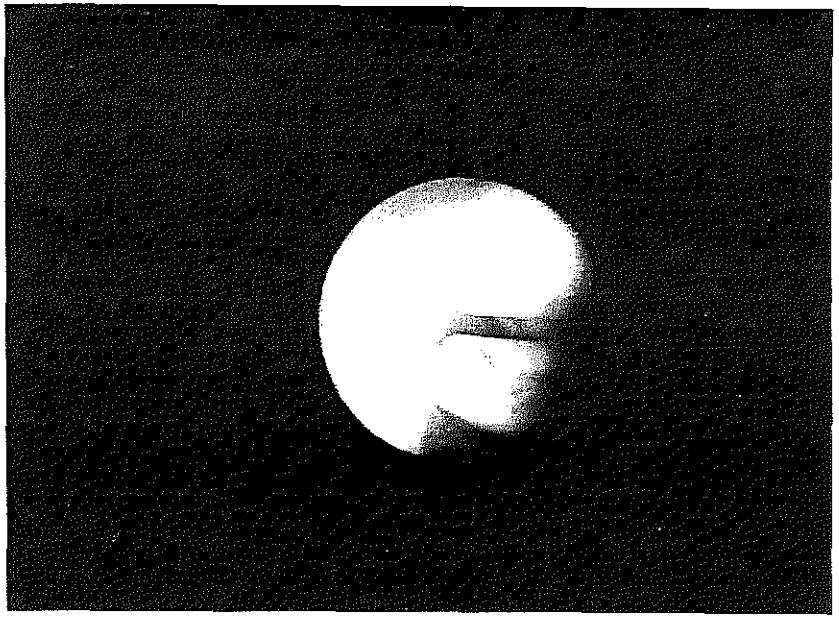
153.696

APPENDIX B
DISTRESS OBSERVED IN EDGE DRAIN PANELS

CONTECH

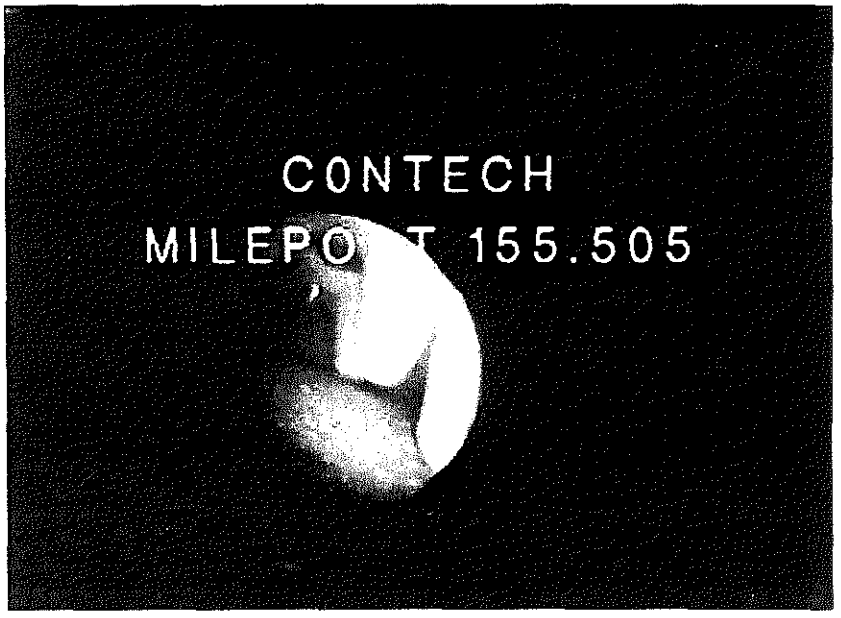


Offset Core, Mid Panel



Rolling of Bottom Posts

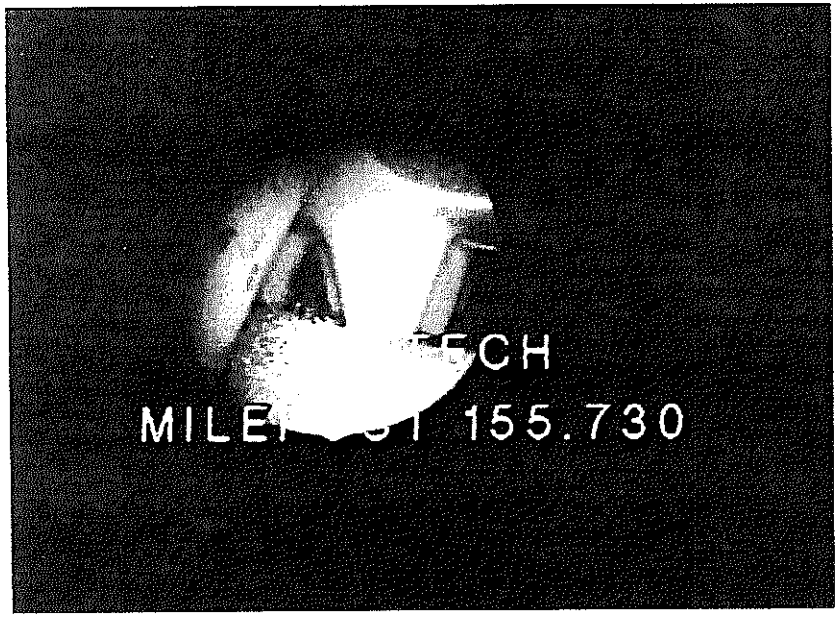
Fabric Intrusion, Mid Panel



Tilting of Post, Bottom of Panel

Diagonal View

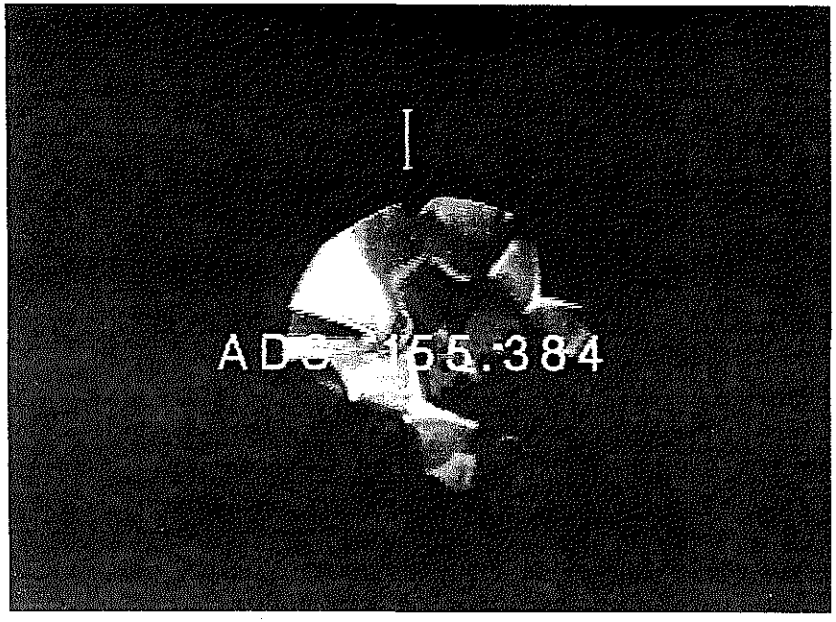
Fabric Intrusion, Mid Panel



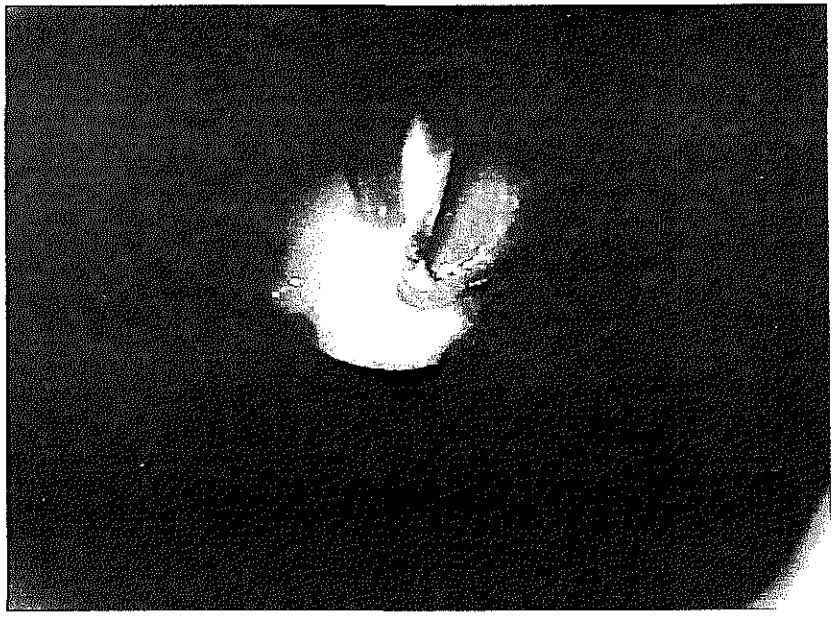
Fabric Intrusion, Mid Panel

Fabric Intrusion, Mid Panel

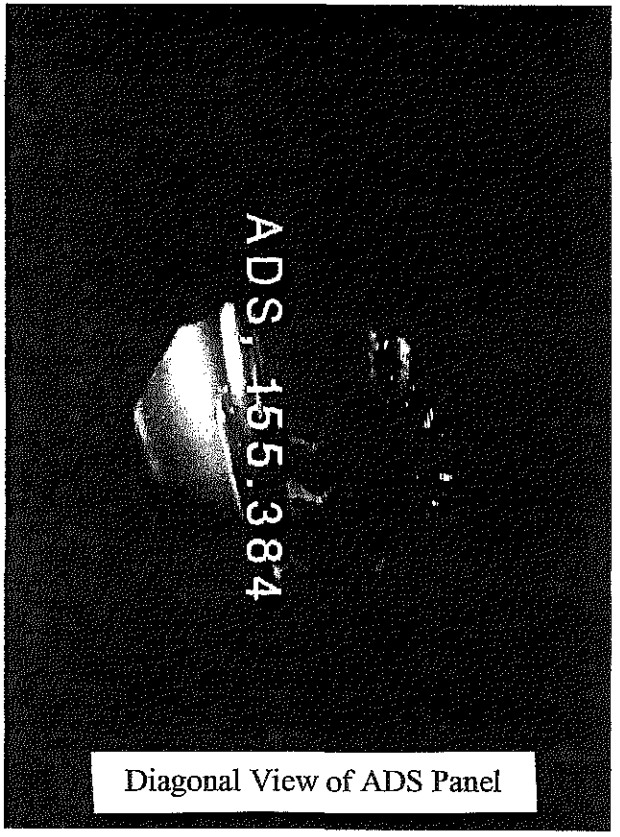
ADVANEDGE



Vertical View of ADS Panel

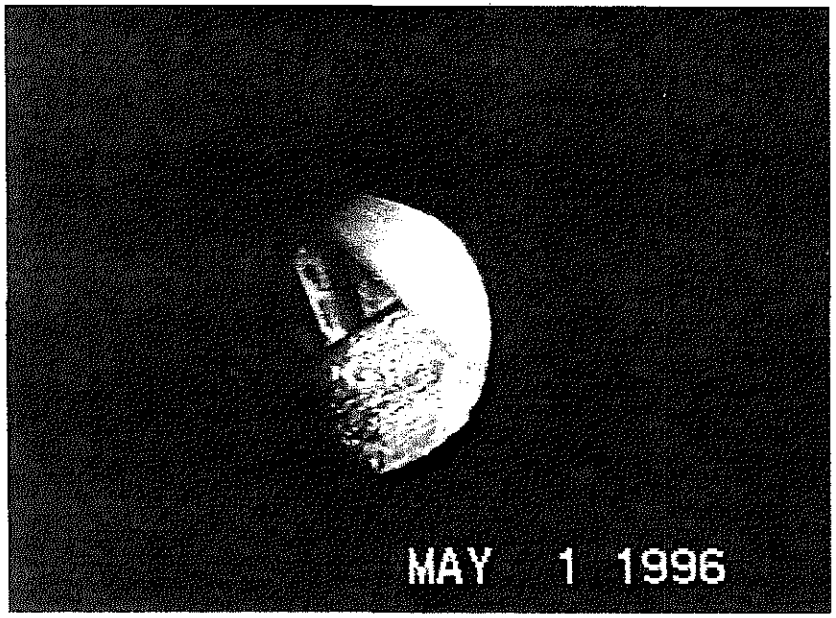


Water Coming Through Bottom Perforations

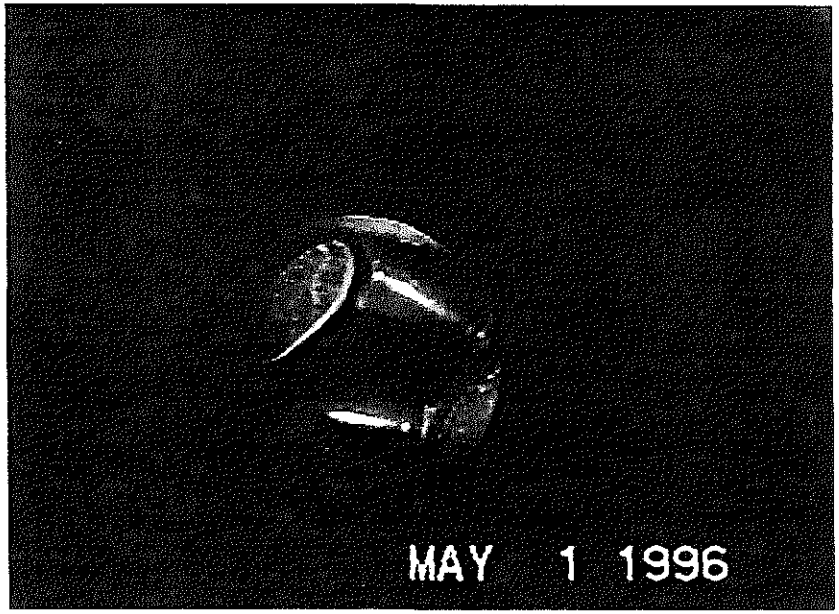


Diagonal View of ADS Panel

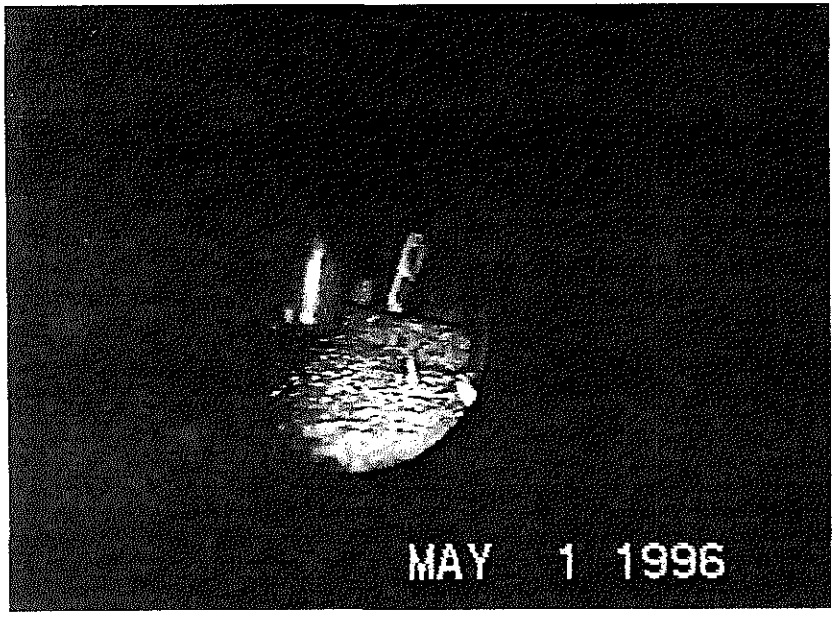
AKWADRAIN



Rolling of Columns, and Fabric Intrusion, Bottom



Compression Between Post



Rolling of Posts, and Fabric Intrusion, Bottom of Panel

Compression Between Post

MULTI-FLOW

View Up Through Vertical Flow Tube

View Down Through Vertical Flow Tube

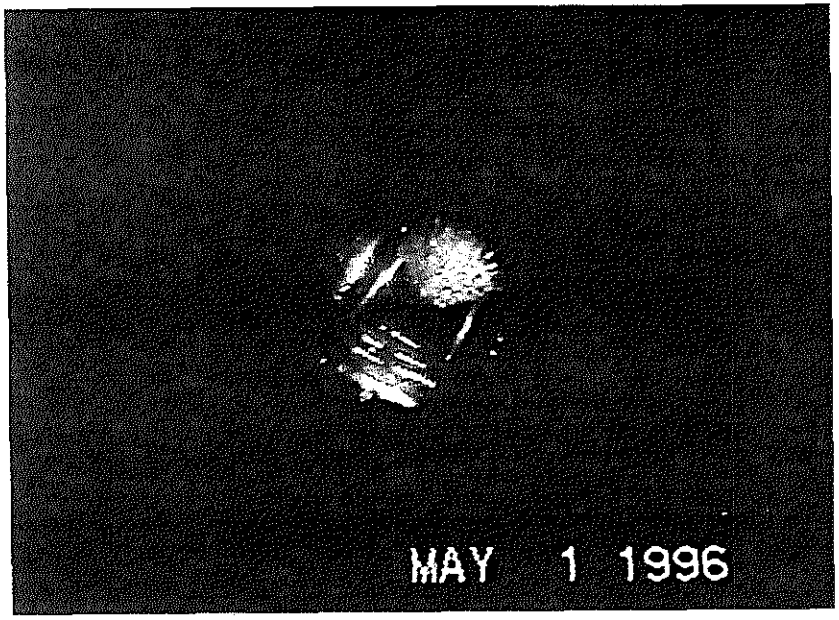
Horizontal Flow Tube

Compressed Vertical Flow Tube

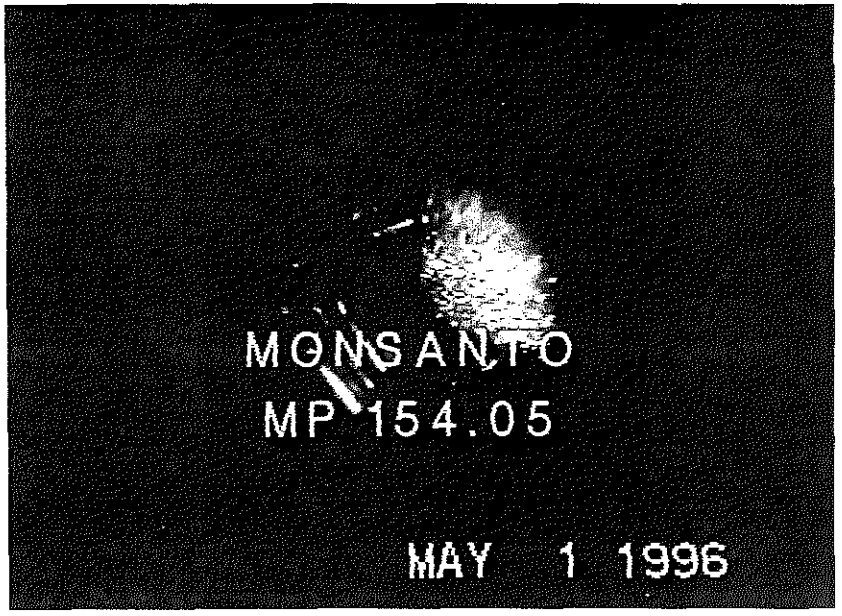
HYDRAWAY

Tilting of Columns, Bottom Panel

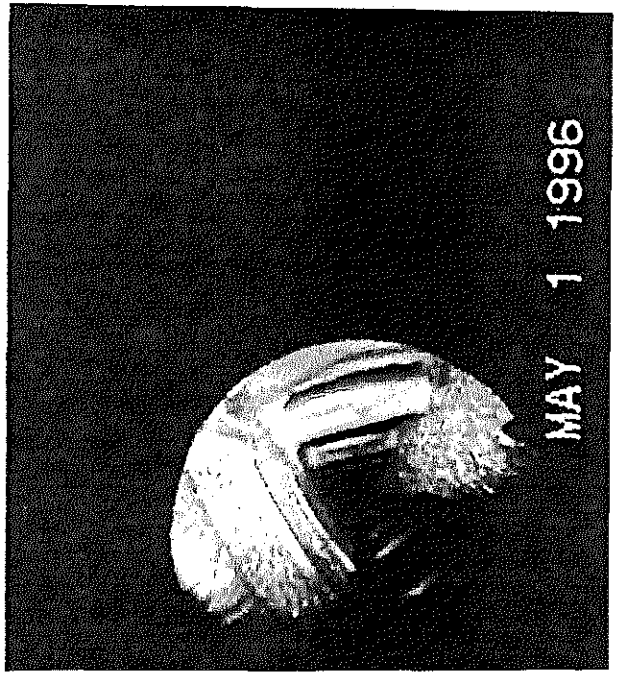
Fabric Intrusion



Fabric Intrusion

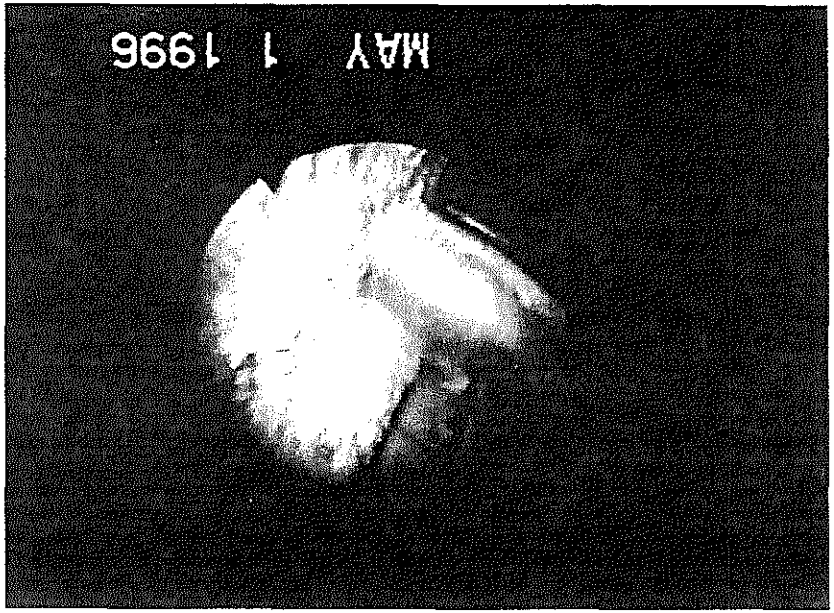


Fabric Intrusion, Bottom of Panel



Rolling of Columns, Fabric Intrusion, Bottom

Rolling of Columns, Fabric Intrusion, Bottom



Rolling of Columns, Fabric Intrusion, Bottom